

TAXONOMIC STUDY OF THE *COREOCARPUS ARIZONICUS* - *C. SONORANUS* (ASTERACEAE, HELIANTHEAE) COMPLEX

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ABSTRACT

Coreocarpus arizonicus and *Coreocarpus sonoranus* are closely related, relatively common elements of the Sonoran Desert of northwestern México. Both are quite variable and relatively few characters serve to distinguish between them. Study of a wide range of specimens from the area concerned suggests that within *C. arizonicus* four intergrading morphogeographical infraspecific elements can be identified: var. *arizonicus*, var. *pubescens*, var. *filiformis*, and var. *sanpedroensis* (E.B. Smith) B.L. Turner, *comb. & stat. nov.* Within *C. sonoranus* two infraspecific taxa are recognized: var. *sonoranus* and var. *libranus* B.L. Turner, *var. nov.* The latter is known only from Sierra Libre, Sonora. A key to the taxa concerned is provided, along with distribution maps, and comments upon their regional variability.

KEY WORDS: Asteraceae, Heliantheae, *Coreocarpus*, México, Arizona, systematics

Coreocarpus is a relatively small genus largely confined to the Sonoran Desert regions of northwestern México. Smith (1989) recognized *Coreocarpus* as having nine species, but two of these were subsequently transferred to the genus *Bidens* by Melchert (Melchert & Turner 1990); even with these two removals the genus appears paraphyletic, for at least two additional species retained in *Coreocarpus*, *C. congregatus* (S.F. Blake) E.B. Smith and *C. insularis* (Brandegee) E.B. Smith, would appear to have their relationships elsewhere. At least one would place in *Coreocarpus* only four species: *C. dissectus* (Benth.) S.F. Blake, *C. parthenioides* Benth., *C. arizonicus*, and *C. sonoranus*. All of these have monomorphic involucre bracts, except for an occasional 1 or 2 much reduced bractlets at the base of the involucre. This has been amply discussed by Smith. Those taxa removed from the genus by Melchert & Turner (1990) have a double involucre, as in *Coreopsis* or *Bidens*. Turner (1991) described an additional species of *Coreocarpus* from near Mexico City, (*C. ixtapanus* B.L. Turner) which he took to be a sister species of *C. congregatus*, noting



Figure 1. Distribution of *Coreocarpus arizonicus* - *C. sonoranus* complex: *C. arizonicus* var. *arizonicus* (open circles); *C. a.* var. *pubescens* (closed triangles); *C. a.* var. *filifolius* (open triangles); *C. a.* var. *sanpedroensis* (closed square); *C. sonoranus* var. *sonoranus* (closed circles); *C. s.* var. *libranus* (open square).

that both of these were questionably placed in *Coreocarpus*. Smith (1991) promptly sunk *C. ixtapanus* into synonymy with his enlarged concept of *C. insularis*. But the question remains: do the taxa concerned belong to *Coreocarpus*, phyletically speaking?

The impetus for the present paper has been occasioned by difficulties with two species of *Coreocarpus*, *C. arizonicus* and *C. sonoranus*. The two are largely distinguished by a syndrome of characters, but best identified by leaf shape, as noted below, and even the latter is subject to considerable variation upon occasion. This has been compounded by much infraspecific variation in both taxa, so much so that I refer to these two taxa in this paper as the *C. arizonicus* - *C. sonoranus* complex.

The following key will distinguish among members of the *Coreocarpus arizonicus* - *C. sonoranus* complex, as recognized here.

1. Leaves with their ultimate divisions variously ovate to deltoid, not at all linear (except on immature growth of secondary shoots); rays yellow or white..... 2. *C. sonoranus*
2. Foliage glabrous or nearly so; lateral divisions of the leaf with sinuses extending to the mid-lines or nearly so; widespread but not in Sierra Libre..... 2a. var. *sonoranus*
2. Foliage moderately to densely pubescent throughout; lateral divisions of the leaf with sinuses not extending to mid-lines; Sierra Libre, Sonora (ca. 78 km N of Guaymas). 2b. var. *libranus*
1. Leaves with their ultimate divisions mostly linear to linear-lanceolate; rays mostly yellow, occasionally white..... 1. *C. arizonicus*
3. Involucres mostly 3-5 mm high; achenes with reduced corky marginal enations; Isla San Pedro. 1d. var. *sanpedroensis*
3. Involucres mostly 5-6 mm high; achenes with well-developed corky wings and/or marginal enations; not on Isla San Pedro.
 4. Foliage moderately and evenly pubescent throughout; pappus bristles mostly present..... 1b. var. *pubescens*
 4. Foliage glabrous or nearly so; pappus bristles mostly absent, rarely present.
 5. Ultimate divisions of leaves relatively short, mostly 2-3(-4) cm long; southern Arizona and closely adjacent Sonora, México. 1a. var. *arizonica*
 5. Ultimate divisions of leaves relatively long and slender, mostly 3-6 cm long; southern Sonora, México and closely adjacent Sinaloa. 1c. var. *filiformis*

1. *COREOCARPUS ARIZONICUS* (A. Gray) S.F. Blake, Proc. Amer. Acad. Arts 49:344. 1913.

As noted in the above key four varieties are recognized within this taxon, as follows:

1a. *COREOCARPUS ARIZONICUS* (A. Gray) S.F. Blake var. *ARIZONICUS*

My concept of this taxon is essentially the same as that rendered by Smith (1989), with the exclusion of *Coreocarpus arizonicus* var. *filiformis* and *C. arizonicus* var. *macrophyllus*, which I would include in my concept of *C. arizonicus* var. *filiformis*, the latter distinguished by its mostly larger leaves with longer, more linear, divisions, as suggested by its epithet.

Collections of var. *arizonicus* are nearly always glabrous or nearly so in the U.S.A., but in northeastern Sonora var. *arizonicus* grades into var. *pubescens*. Indeed, a case could readily be made for the recognition of but a single widespread highly variable species without infraspecific categories, but this would deny the morphogeographical patterns portrayed in Figure 1.

1b. *COREOCARPUS ARIZONICUS* (A. Gray) S.F. Blake var. *PUBESCENS* (B.L. Rob.) Fern., Proc. Amer. Acad. Arts 49:344. 1913.

My concept of this taxon is about the same as that of Smith (1989). It is only weakly differentiated from var. *arizonicus*, intermediates between these not uncommon in areas of contiguity, as noted in the above.

1c. *COREOCARPUS ARIZONICUS* (A. Gray) S.F. Blake var. *FILIFORMIS* (A. Gray) S.F. Blake, Proc. Amer. Acad. Arts 49:344. 1913.

Leptosyne arizonicus var. *filiformis* Greenm. (1904). TYPE: MEXICO. Sinaloa: 80 km NE Choix (LECTOTYPE [selected by Smith 1989]).

Coreocarpus arizonicus (A. Gray) S.F. Blake var. *macrophyllus* Sherff (1935). TYPE: MEXICO. Chihuahua: "southwestern Chihuahua".

Smith (1989) included this taxon in his broad concept of *Coreocarpus arizonicus* var. *arizonicus*, but I think it to be as distinctive, if not more so, than var. *pubescens*, which he maintained. It is seemingly equally close to *C. sanpedroensis*, hence my reduction of the latter, as follows:

1d. *COREOCARPUS ARIZONICUS* (A. Gray) S.F. Blake var. *SANPEDROENSIS* (E.B. Smith) B.L. Turner, *comb. & stat. nov.* BASIONYM: *Coreocarpus sanpedroensis* E.B. Smith, Amer. J. Bot. 72:262. 1985.

This is a very weakly differentiated infraspecific element of *Coreocarpus arizonicus* and were it not confined to the Isla de San Pedro, likely not to have been recognized. Smith (1989) distinguished it from *C. arizonicus* by its achenes which are said to have margins which are corky and involute, dissected into separate teeth, albeit "highly reduced to nearly obsolete in *C. sanpedroensis*." My examination of numerous achenes of var. *arizonicus* and var. *sanpedroensis* suggest that the differences between the two are mostly quantitative: var. *sanpedroensis*, in general,

has somewhat smaller heads with somewhat smaller achenes having somewhat less well-developed marginal enations, otherwise they are scarcely different.

2. *COREOCARPUS SONORANUS* Sherff, Bot. Gaz. (Crawfordsville) 97:604. 1936.

Two infraspecific categories are reorganized under this species, as follows:

1. Foliage glabrous; sinuses of leaves extending to or near their mid-lines; pappus awns mostly absent, sometimes present; widespread in western Sonora. 2a. var. *sonoranus*
1. Foliage markedly pubescent; sinus of leaves not extending to their midlines; pappus awns mostly present; Sierra Libre, Sonora. 2b. var. *libranus*

2a. *COREOCARPUS SONORANUS* Sherff var. *SONORANUS*

Coreocarpus johnstonii Sherff (1936)

Coreocarpus shrevei Sherff var. *latilobus* Sherff (1935)

Except for the inclusion of material referable to my newly described var. *libranus* (cf. below), this taxon is aptly described by Smith (1989). He notes that *Coreocarpus johnstonii* and *C. sonoranus* were described at the same time, but he selected the latter as the most desirable name since he considered *C. johnstonii* to be typified by an ecotypic (coastal) variant.

As can be noted in Figure 1, *Coreocarpus sonoranus* is relatively widespread but, so far as known does not co-occur with *C. arizonicus*. Nevertheless, it is quite variable, both as regards ray color (mostly white, sometimes yellow), and pappus bristles (mostly absent, sometimes present). It is most readily distinguished from *C. arizonicus* by its less linear-dissected leaves, as indicated in my key. Nevertheless, occasional plants with young or immature secondary leaflets may superficially resemble *C. arizonicus*, and it is possible that the two taxa have exchanged genes in the distant past, this perhaps accounting for the occurrence of white and yellow rays in both taxa.

2b. *COREOCARPUS SONORANUS* Sherff var. *LIBRANUS* B.L. Turner, var. nov. TYPE: MEXICO. Sonora: Mpio. Hermansillo, Sierra Libre, Canyon E of Restaurante La Pintata, Cerro Bola, ca. 600 m, 3 Jan 1984, R.K. & Tom Van Devender 84-36 (HOLOTYPE: TEX!; Isotype: ARIZ!).

Differt a *C. sonorano* Sherff habendo folia minus dissecta, moderate pubescentia, cum sinibus vadosioribus, et achenia plerumque papposa.

Suffruticose perennial herbs 30-50 cm high. Leaves broadly ovate in outline, mostly tripartite-dissected, moderately pubescent, those at midstem mostly 3-6 cm long, 3-4 cm wide; petioles 1.0-2.5 cm long; sinuses of the blade not extending to mid-lines. Heads 1-4, mostly terminal, the ultimate peduncles 1-3 cm long. Involucres pubescent, 5-6 mm high. Ray florets ca. 5; ligules white, 4-8 mm long.

Disk florets 20-40, the corollas yellow. Achenes mostly 3.5-4.0 mm long, the margins beset with 6-9 corky enations; pappus of 2 persistent awns 1-2 mm long, sometimes absent.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Sonora (all from Sierra Libre): Mpio. Hermansillo, Cerro Bola, 600 m, 18 Apr 1993, *Búrquez 93-030* (LL); near small reservoir in Cañada Las Chivas, 0.1 km SE of cave with paintings, slopes of volcanic rock, 320 m, 16 Nov 1984, *Burgess 6723* (ARIZ); La Pintada Canyon, 9 Nov 1986, *Smith 3972* (TEX); La Pintada Canyon, 7 and 9 Feb, 1978, *Van Devender s.n.* (ARIZ); same locality 1 Jan 1982, *Van Devender s.n.* (ARIZ); same locality, 1 Jan 1983, *Van Devender s.n.* (ARIZ).

This novelty was called to my attention (over protest!) by Dr. Tom Van Devender, who perceived its distinction from the more typical elements of *Coreocarpus sonoranus*. Smith (by annotation, 1986, and publication, 1984) identified most of the specimens cited above as belonging to the latter, but did note on annotations of both the holotype and isotype that the plants were "near *Coreocarpus sonoranus* Sherff, but achenes aristate & plant very pubescent!!" Indeed, *C. sonoranus* var. *libranus*, in my opinion, is as distinct, if not more so, from var. *sonoranus* as is *C. arizonicus* var. *sanpedroensis* from *C. arizonicus* var. *arizonicus*, hence an additional reason for my reduction of *C. sanpedroensis* to varietal status here.

Var. *libranus* receives its name from the Sierra Libre, to which it is apparently endemic. So far as known, var. *sonoranus* has not been collected in this massif. Yetman & Búrquez (1996) have presented an interesting account of Sierra Libre (100-1100 m elevation).

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